MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The REVIEW for November, 1896, is based on 2,738 reports from stations occupied by regular and voluntary observers, classified as follows: 137 from Weather Bureau stations; 33 from U. S. Army post surgeons; 2,425 from voluntary observers; 33 from Canadian stations; 1 from Hawaii; 96 received through the Southern Pacific Railway Company; 14 from U. S. Life-Saving stations. International simultaneous observations are received from a few stations and used together with trustworthy newspaper extracts and special reports.

The WEATHER REVIEW is prepared under the general editorial supervision of Prof. Cleveland Abbe. Unless otherwise specifically noted, the text is written by the Editor, but the statistical tables are furnished by Mr. A. J. Henry, Chief of the Division of Records and Meteorological Data. Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada, Mr. Curtis J. Lyons, Meteorologist to the Government Survey, Honolulu, and Dr. Mariano Bárcena, Director of the Central Meteorological Observatory of Mexico.

CLIMATOLOGY OF THE MONTH.

GENERAL CHARACTERISTICS.

The most important storms of November were those of the 5th and the 2d–6th in the Lake Region. The remarkable feature of the month was the area of low temperature and high pressure that prevailed from the western Canadian Provinces southward to the Mississippi and Missouri valleys, as well as the corresponding area of high temperature that prevailed in the Atlantic States. The mean temperature was the lowest on record at many stations in the former region as well as in Oregon and was the highest on record at most stations in the latter region. Equally remarkable was the heavy rainfall in the watershed of the Ohio River and on the coasts of Washington and Oregon. An unusual quantity of snow fell over the Rocky Mountain Region and the northern Slope and eastward to Manitoba and the upper Lakes, leaving an unusually thick layer of snow on the ground at the end of the month. Remarkable floods occurred in the Willamette, due to melting snow; remarkable gorges in the Chippewa and upper Mississippi rivers due to the freezing up of booms of logs; unusually good stages of water for navigation prevailed in the Ohio River. In British Columbia the cold and wind and heavy snow were unprecedented. The cold wave of the 26–30th was preceded by a furious wind with snow in Manitoba on the 25th.

ATMOSPHERIC PRESSURE.

[In inches and hundredths.]

The distribution of mean atmospheric pressure reduced to sea level, as shown by mercurial barometers, not reduced to standard gravity, and as determined from observations taken daily at 8 a. m. and 8 p. m. (seventy-fifth meridian time), is shown by isobars on Chart IV. That portion of the reduction to standard gravity that depends on latitude is shown by the numbers printed on the right-hand border.

The *mean pressures* during the current month were high in the region over and east of the Rocky Mountains, as also over and east of the Atlantic Coast States. Areas of low pressure prevailed from Oregon westward, from Arizona southward, and over the eastern portion of Lake Superior.

The highest pressures were: In Canada, Edmonton, 30.36; Battleford, 30.35; Banff, 30.29; in the United States, Havre and Bismarck, 30.27; Lynchburg, Norfolk, Raleigh, and Wilmington, 30.26; Helena, Williston, Charleston, and Hatteras, 30.25.

The lowest were: In Canada, Esquimault, 29.97; St. Johns, N. F., 30.03; in the United States, Tatoosh Island, 29.95; Fort Canby and Phœnix, 29.96; Yuma, 29.97.

As compared with the normal for November, the mean pressure was in excess over the entire country east of the Rocky Mountains except the valley of the Rio Grande. It was deficient over the Plateau Region and Pacific Coast. The greatest excesses were: at Canadian stations, Edmonton, 0.38; Qu'Appelle, 0.23; Calgary and Swift Current, 0.22; Bermuda, 0.21; in the United States, Bismarck and Eastport, 0.19; Havre, 0.18. The greatest deficits were: Roseburg and Fort Canby, 0.09.

As compared with the preceding month of October, the pressures reduced to sea level show a rise everywhere except in western Oregon, the center of the upper Lake Region, and Newfoundland. The greatest rises were: Edmonton, 0.35; Battleford, 0.33; Calgary, 0.28; Prince Albert, 0.26; Swift Current and Havre, 0.25. The greatest falls were: Tatoosh Island, 0.07; Fort Canby and Esquimault, 0.05.

AREAS OF HIGH AND LOW PRESSURE.

By Prof. H. A. HAZEN.

During November five high areas and eight lows were sufficiently defined to be mapped (see Charts Nos. II and I). The principal characteristics relating to the origin and motion of

these highs and lows will be found in the accompanying table:

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	*	35	90	5, a.m.	45	60	2,140	5.0	428	17.9
II	5, p.m.	52	117	11, p.m.	46	57	4,090	6.0	681	28.4
III	10, a.m.	52	109	16, p.m.	33	79	3,380	6.5	521	21.7
IV	21, a.m.	51	110	23, p.m.	44	60	2,560	2.5	1,022	42.6
V	24, a.m.	48	94	26, p.m.	47	60	1,640	2.5	655	27.3
Sums							13,810	22.5	3,307	
Mean of 5 paths									661	27.6
Mean of 22.5 days									614	25.6
Low areas.										
I	1, p.m.	39	99	6, p.m.	51	69	2,850	5.0	570	23.7
II	3, p.m.	52	119	9, p.m.	47	59	3,680	6.0	613	25.5
III	7, p.m.	48	127	12, a.m.	50	64	4,100	4.5	912	38.0
IV	11, p.m.	31	94	14, a.m.	45	59	2,110	2.5	845	35.2
V	12, a.m.	49	127	17, a.m.	49	66	2,950	5.0	590	24.6
VI	16, p.m.	43	124	19, a.m.	47	63	3,290	2.5	1,315	54.8
VII	21, a.m.	46	127	24, a.m.	52	69	2,940	3.0	980	40.8
VIII	23, a.m.	38	124	28, a.m.	46	70	3,330	5.0	666	27.8
Sums							25,250	33.5	6,491	
Mean of 8 paths									811	33.8
Mean of 33.5 days									754	31.4

*October 31, a.m.

HIGHS.

The highs were mostly formed to the north of Montana or were detached from the rather permanent high in that region. Nos. I, II, and III had most of their course in south latitudes in the Gulf States. All of the highs, except No. III, finally reached Nova Scotia, and were last noted to the south of Newfoundland. No. III disappeared on the 16th in a subpermanent high off the South Carolina coast, which remained stationary until the 18th, p. m. Reduced pressures of 31.00 and above were frequently noted in Montana and to the north. The mean of 30.27 at Havre was the highest mean November pressure ever noted in that region. There was also an abnormally high pressure in the southeast States, reaching 30.26 at Raleigh and Wilmington, which is the highest mean November pressure noted in the South Atlantic States.

LOWS.

All of the low areas of the month, except Nos. I and IV, originated on or off the north Pacific Coast, No. I was first noted p. m. of 1st in Kansas, and No. IV p. m. of 11th in east Texas. The general trend of the lows was to the east and a little south of east till the Mississippi Valley was reached, when they turned northeast, and nearly all crossed a point just to the east of Lake Superior. All the lows disappeared in or near the Gulf of St. Lawrence. No. I was very severe in the Lake Region on the 5th; Buffalo reported 68 miles per hour, and Detroit 52 miles on afternoon of that day. No. III caused 48 miles at Chicago on p. m. of 10th, and 38 miles at Sault Ste. Marie on a. m. of 11th, Buffalo also reported 60 miles per hour on afternoon of 11th. When No. VIII reached the Lake Region it caused winds of 52 miles at Chicago, a. m. of 27th.

A remarkable feature of the storms of this month was the very great velocity, 54.8 miles hourly for No. VI. Both the high area and low area velocity between the 16th and 24th was quite abnormal, averaging 46.1 miles per hour for the two lows and one high. This would seem to show a common origin for the motion of these conditions. It should be borne in mind, however, that during this same period there were subpermanent highs nearly stationary to the north of Montana and in the southeast Atlantic States.

LOCAL STORMS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

There were but two local storms properly so-called during November. Severe general storms, using that term as indicating a storm of wide extent, swept over the Lake Region on the 5th and 10th. Unusually heavy rains, at times mixed with snow and sleet, fell in Washington, Oregon, and Idaho on the 11th, 12th, 13th, 14th, 15th, and 16th, producing dangerous floods in the rivers and small streams. Travel was interrupted, transportation lines damaged, bridges washed away, and much movable property was swept down the rivers.

On the 23d an area of low pressure appeared on the California coast. It moved a little south of east, and on the morning of the 25th covered south-central Utah. About 3 p. m., central time, of the last-named date a minor tornado occurred in McLennan County, Tex., passing near the little town of Mart. One person was killed and three injured. Two dwelling houses were completely destroyed and five injured. The property loss was about $2,000; path of greatest destruction, 30 to 60 yards wide and about 8 miles long. Moved northeast.

On the morning of the 26th the storm center covered Iowa, eastern Kansas, and northwestern Missouri. The temperature gradients westward were exceedingly sharp, and high winds and snow prevailed northward to the British boundary and westward to the Rocky Mountain Region, while the temperature of springtime prevailed over the southern Mississippi Valley and the Gulf Coast.

A minor tornado was observed at 10.30 p. m., central time, near Tunica, Miss. One person was killed and one injured. Property loss was about $1,500. Path 300 yards wide; length unknown. Storm said to have moved northwest.

Strong winds and gales were reported in southern Illinois and western Kentucky. Press dispatches state that houses were blown down at Kuttawa, Eddyville, and Mayfield. No lives lost.

From four to eight lives were lost in Minnesota and the Dakotas as a result of the severity of the weather during the 26th and 27th.

LOCAL STORMS IN OCTOBER, 1896.

A West India hurricane moved slowly northeastward, but at some distance from the Atlantic Coast line on the 10th, 11th, 12th, and 13th, causing very high tides and dangerous gales, especially on the New Jersey, Long Island, and New England coasts. Much damage was done to bulkheads, wharves, piers, and other property on the immediate shore line. Beach property on the New Jersey and Long Island coasts suffered heavily. Probably half a million dollars will be required to repair and replace the property damaged and destroyed.

Minor tornadoes occurred in Texas, Oklahoma, Arkansas, Louisiana, and Mississippi, on the 22d, 28th, and 29th. The record in detail is as follows:

1st–2d.—A succession of heavy downpours in the upper San Pedro Valley (Arizona) caused a disastrous flood in the river. Five persons were drowned, and property valued at $10,000 was destroyed.

9th.—The voluntary observer at Lake Butler, Fla., Mr. John A. King, reports that a "cyclone" (by which we presume he means merely a severe local storm) occurred near his station on this date. One dwelling and an outbuilding were destroyed. No details of the storm were reported.

22d.—A minor tornado was observed near Seguin, Tex., a little after 4 p. m., probably central time, of the 22d, by Mr. Samuel Neel. Property loss was small; path 300 feet wide